



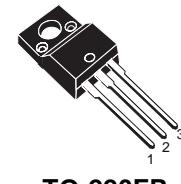
STGF10NB60SD

N-CHANNEL 10A - 600V TO-220FP

PowerMESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$ (Max) @25°C	I_C @100°C
STGF10NB60SD	600	< 1.8 V	10 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE



TO-220FP

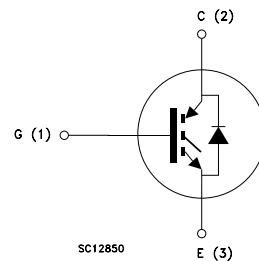
DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

APPLICATIONS

- LIGHT DIMMER
- STATIC RELAYS
- MOTOR CONTROL

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	600	V
V_{ECR}	Reverse Battery Protection	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	20	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	10	A
$I_{CM} (\bullet)$	Collector Current (pulsed)	80	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	25	W
	Derating Factor	0.2	W/ $^\circ\text{C}$
V_{ISO}	Insulation Withstand Voltage A.C. ($t = 1$ sec; $T_C = 25^\circ\text{C}$)	2500	V
T_{stg}	Storage Temperature	-65 to 150	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	150	$^\circ\text{C}$

(•) Pulse width limited by safe operating area

STGF10NB60SD

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collector-Emitter Break-down Voltage	I _C = 250 µA, V _{GE} = 0,	600			V
V _{BR(CES)}	Emitter Collector Break-down Voltage	I _C = 1 mA, V _{GE} = 0,	20			V
I _{CES}	Collector cut-off Current (V _{GE} = 0)	V _{CE} = Max Rating, T _j = 25 °C V _{CE} = Max Rating, T _j = 125 °C			10 100	µA µA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 20V, V _{CE} = 0			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250µA	2.5		5	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 5 A, T _j = 25°C V _{GE} = 15V, I _C = 10 A, T _j = 25°C V _{GE} = 15V, I _C = 10 A, T _j = 125°C		1.15 1.35 1.25	1.8	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V, I _C = 10 A	5			S
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		610 65 12		pF pF pF
Q _g	Gate Charge	V _{CE} = 400V, I _C = 10 A, V _{GE} = 15V		33		nC
I _{CL}	Latching Current	V _{clamp} = 480V, R _G = 1kΩ, T _j = 125°C	20			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480 \text{ V}$, $I_C = 10 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{GE} = 15 \text{ V}$		0.7 0.46		μs μs
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 \text{ V}$, $I_C = 10 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{GE} = 15 \text{ V}$		8 0.6		$\text{A}/\mu\text{s}$ mJ

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{off})$	Cross-over Time Off Voltage Rise Time	$V_{clamp} = 480 \text{ V}$, $I_C = 10 \text{ A}$, $R_{GE} = 1\text{K}\Omega$, $V_{GE} = 15 \text{ V}$		2.2 1.2		μs μs
t_f $E_{off}^{(**)}$	Fall Time Turn-off Switching Loss			1.2 5.0		μs mJ
t_c $t_r(V_{off})$	Cross-over Time Off Voltage Rise Time	$V_{clamp} = 480 \text{ V}$, $I_C = 10 \text{ A}$, $R_{GE} = 1\text{K}\Omega$, $V_{GE} = 15 \text{ V}$		3.8 1.2		μs μs
t_f $E_{off}^{(**)}$	Fall Time Turn-off Switching Loss	$T_j = 125^\circ\text{C}$		1.9 8.0		μs mJ

COLLECTOR-EMITTER DIODE

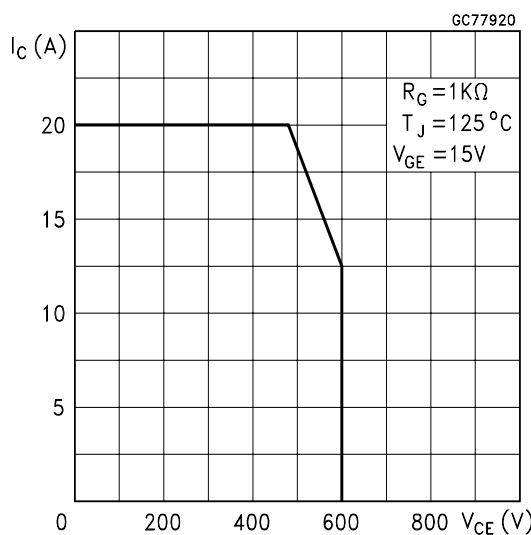
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				7 56	A A
V_f	Forward On-Voltage	$I_f = 3.5 \text{ A}$ $I_f = 3.5 \text{ A}$, $T_j = 125^\circ\text{C}$		1.4 1.15	1.9	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f = 7 \text{ A}$, $V_R = 20 \text{ V}$, $T_j = 125^\circ\text{C}$, $di/dt = 100\text{A}/\mu\text{s}$		50 70 2.7		ns nC A

(●)Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

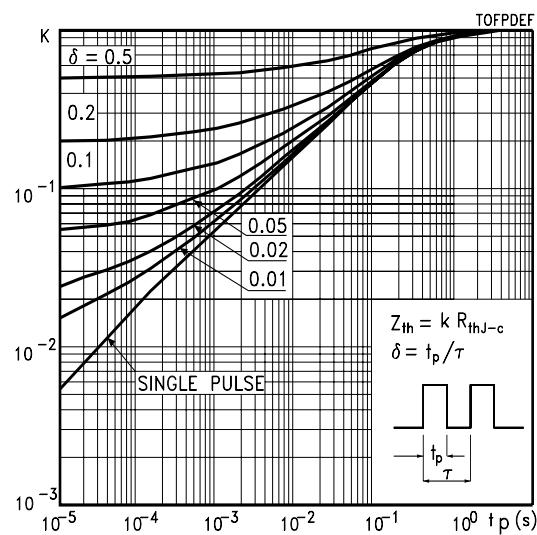
(1)Pulse width limited by max. junction temperature.

(**)Losses Include Also the Tail

Switching Off Safe Operating Area

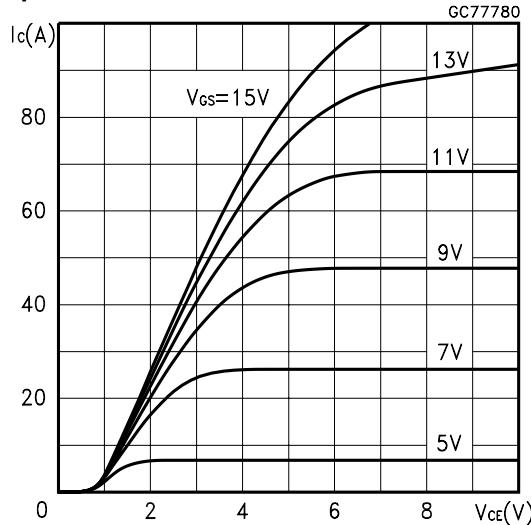


Thermal Impedance

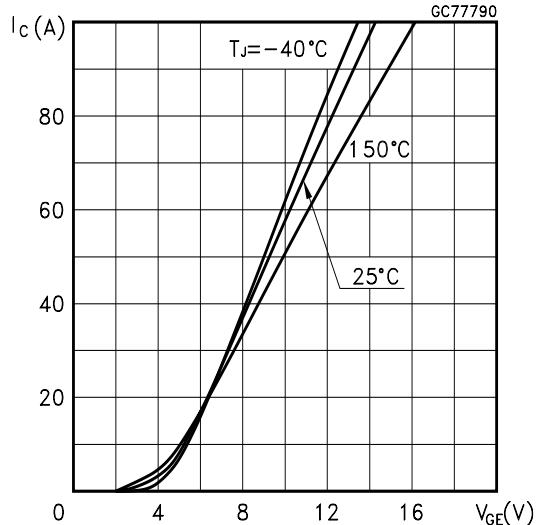


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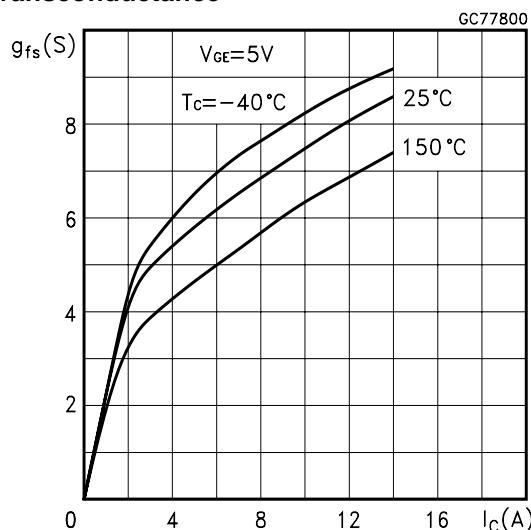
Output Characteristics



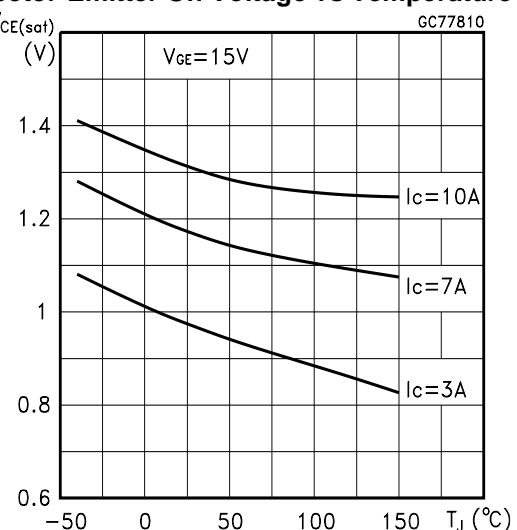
Transfer Characteristics



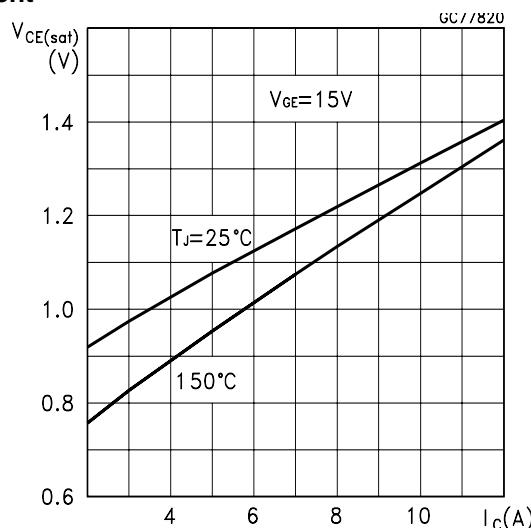
Transconductance



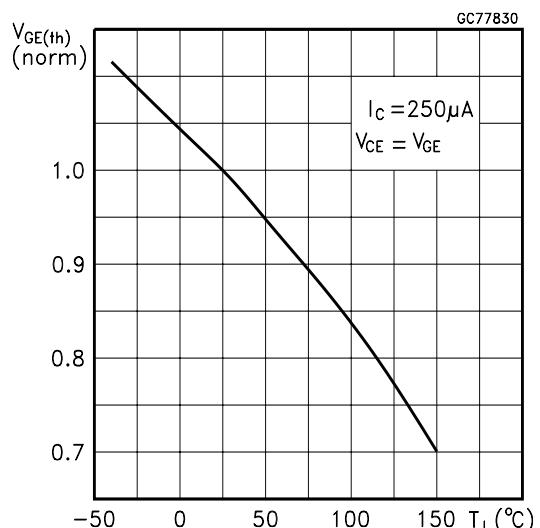
Collector-Emitter On Voltage vs Temperature



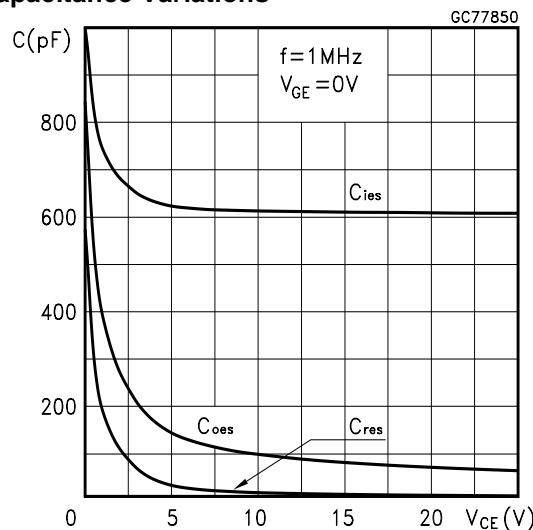
Collector-Emitter On Voltage vs Collector Current



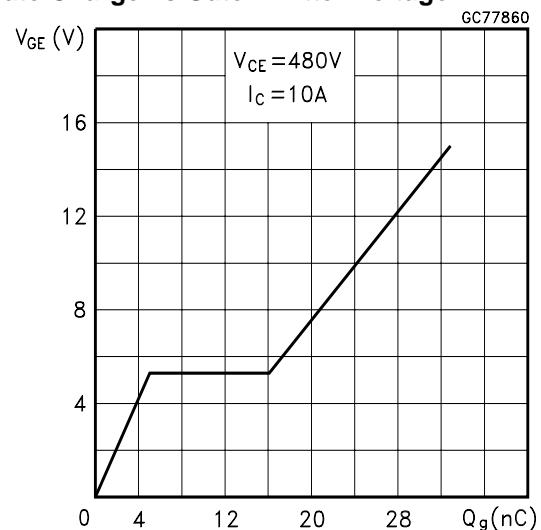
Gate Threshold Voltage vs Temperature



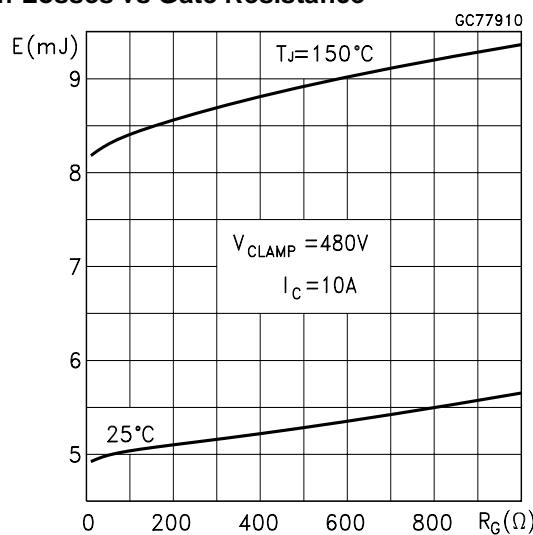
Capacitance Variations



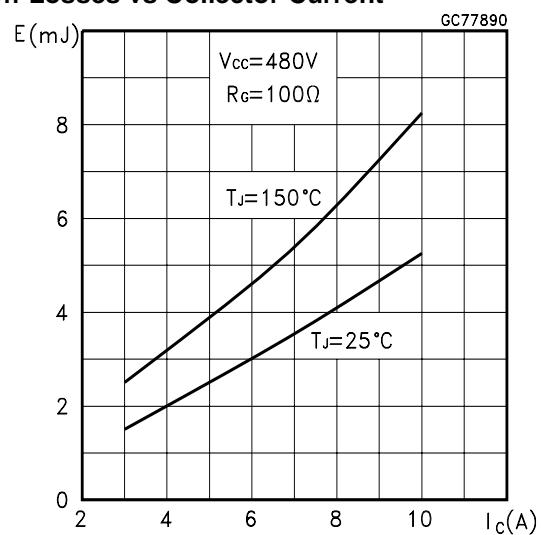
Gate Charge vs Gate-Emitter Voltage



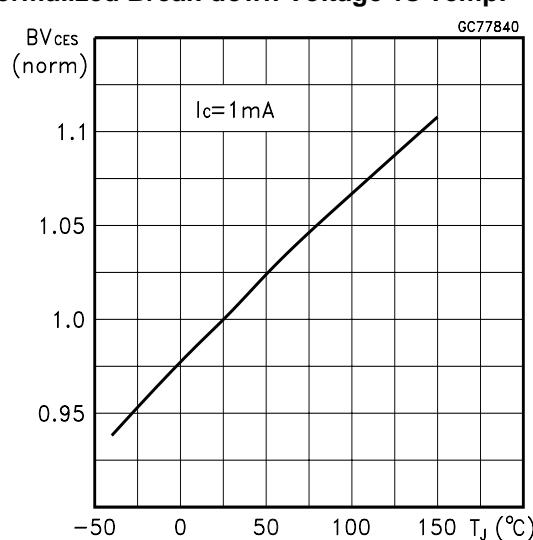
Off Losses vs Gate Resistance



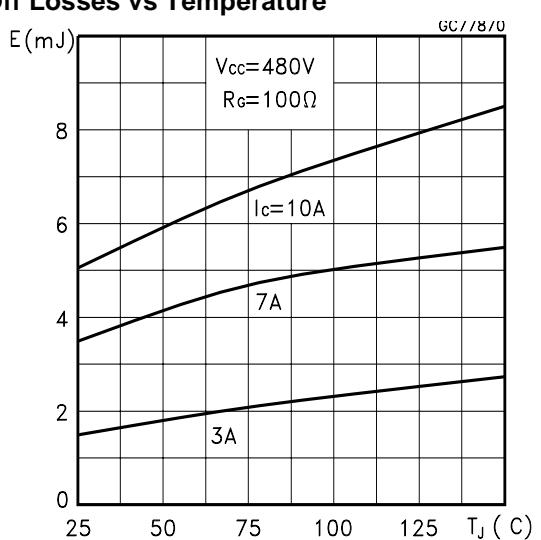
Off Losses vs Collector Current



Normalized Break-down Voltage vs Temp.



Off Losses vs Temperature



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Emitter-Collector Diode Characteristics

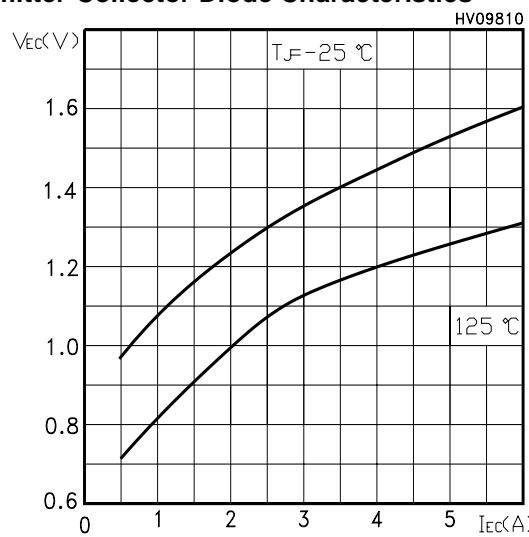


Fig. 1: Gate Charge test Circuit

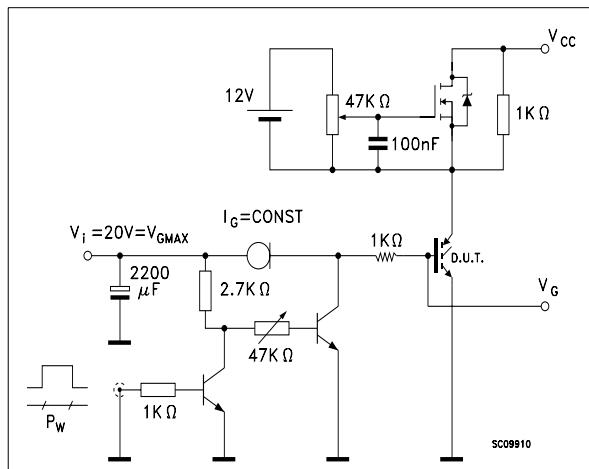
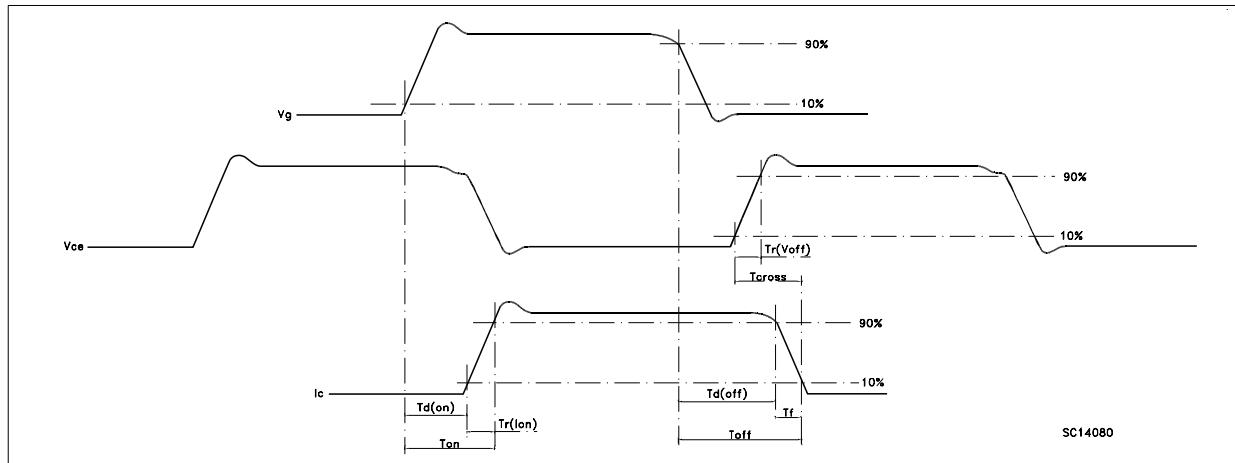
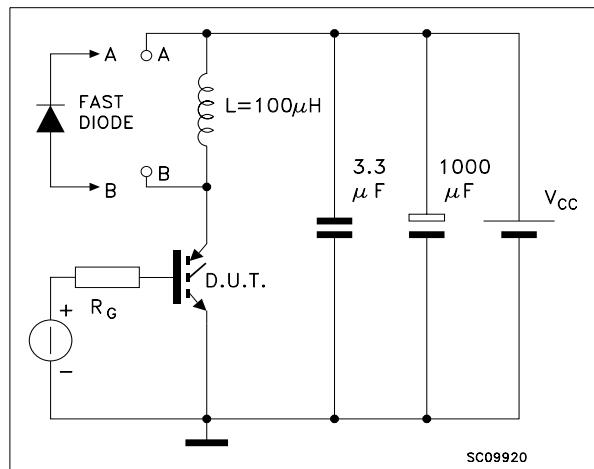
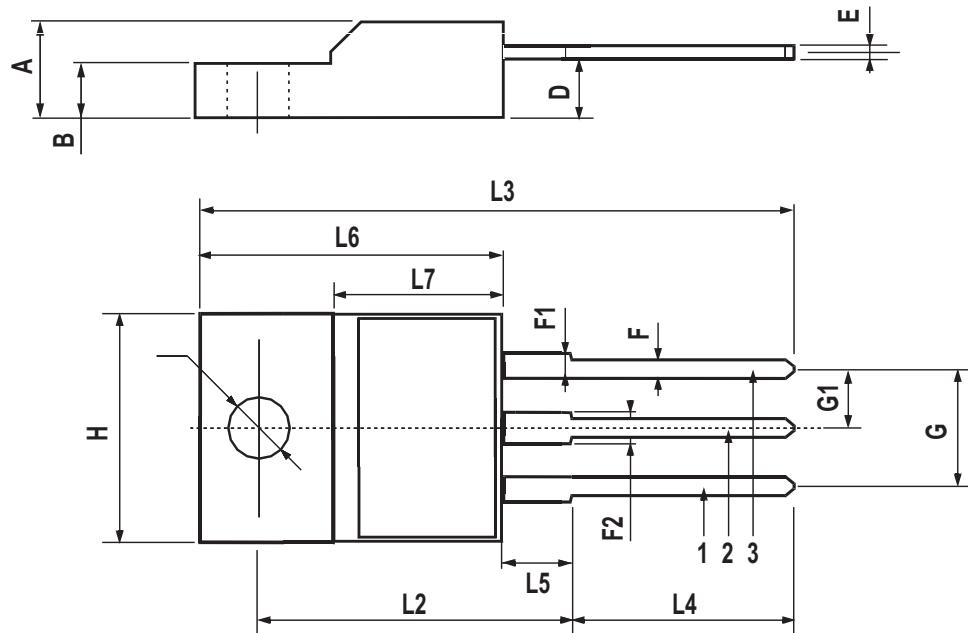


Fig. 2: Test Circuit For Inductive Load Switching



TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.5	0.045		0.067
F2	1.15		1.5	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



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